IET Smart Grid

Editorial

Inaugural Editorial

ISSN
E-First on 20th April 2018
doi: 10.1049/iet-stg.2018.0050
www.ietdl.org

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Introduction

Access to energy services plays a vital role in enhancing both a country's economic development and human well-being. Electricity networks are central to providing energy services to billions of people in the world, but are going through rapid and substantial changes due to technological innovations in the areas of renewable energy, energy storage, and information and communication technologies (ICT). These developments give rise to a number of grand challenges or questions to answer, such as:

- How can renewable energy sources be efficiently integrated into power grids given their intermittent properties?
- How can the significant uptake of electric vehicles in the coming decades be managed?
- How can consumers be engaged to optimise their energy usages or costs?
- How can bi-directional power flows caused by the increasing use of distributed generations be addressed?

To address these challenges, it is very important to adopt interdisciplinary approaches, and properly combine modern control, communication, and computing technologies to build a self-directed and self-healing smart grid. This includes a variety of advanced technologies, such as microgrids, demand side management, smart metering, and home/building energy management systems. Moreover, regulatory and commercial arrangements are also needed in order to ensure that the needs of consumers can be met given social and environmental constraints.

We are pledged to promote *IET Smart Grid* as a high quality and open access platform for disseminating cutting-edge research addressing these issues, with the goal of accelerating the adoption of such technologies in practice. The topics of interest include, but are not limited to, the following domains:

(1) Smart grid management

- Smart grid device management
- Transactive energy and microgrids
- Demand side management and demand response
- Smart metering and pricing
- Home and building energy management
- Electric vehicle (EV) charging
- Energy storage management

(2) ICT technologies for power systems

- Advanced communications and networking
- Artificial intelligence and machine learning
- Data analytics and forecasting
- Secure and resilient ICT infrastructure
- Cyber-attack defence and bad data detection
- Cyber-physical architectures and methods
- Consumer privacy preservation and inference

These topics are further categorised into five subject areas as follows:

(1) Management of smart grid devices and microgrids
(2) Management of energy demand, storage, and EVs
(3) Power system cyber-security and privacy
(4) Communications and networking for power systems
(5) Artificial intelligence and data analytics for power systems

The editorial board is organized by subject area, and consists of world-leading experts in their own research domains from internationally renowned universities and organisations. We aim to ensure a rigorous peer review process for every manuscript that fits the above scope. The target submission-to-first decision time is six weeks.

We welcome and encourage submissions of original research results in these research areas, and also welcome submissions of any original results that may cross disciplines, e.g., ICT for power systems including communications and networking, artificial intelligence, data analytics, and cyber-physical security and architectures for power systems.

There are four papers selected for publication in this inaugural issue. They have undergone the peer review process, and we thank our authors and peer reviewers for their timely and important contribution.

In the first paper, Danielle Meyer and Jiankang Wang provide a review of the planning methods for ultra-fast charging stations for electric vehicles from the power grid perspective, together with a comprehensive study of the location and size of renewable energy sources to better support ultra-fast charging systems. The second paper, authored by Timur Sayfutdinov, Haris Patsios, Janusz Bialek, David Greenwood, and Philip Taylor, presents new methodologies for optimally choosing the size and technology of energy storage systems for supporting power system applications. In the third paper, Andrew Wright from the UK Office of Gas and Electricity Markets (OFGEM) provides important insights into the reform of power system governance when the power system has an increasing number of intermittent energy sources and active demand. This is likely to lead to several changes in the electricity markets and regulation, e.g., changes related to short-term flexibility, demand side participation, role of data to decision-making, and security of supply. The final paper, authored by Yi Qian, Shengjie Xu, and Rose Qingyang Hu, studies two methods of improving the reliability of communication networks for advanced metering infrastructures (AMIs) in smart grid. Incremental network design is used to improve the communication robustness against network failures.

We would like to thank the authors and reviewers again for their contributions, and welcome new submissions to *IET Smart Grid*. Guest editorial teams are also welcome to propose special issues new emerging areas of smart grid research.

Editor Biographies

Hongjian Sun

Hongjian Sun received his Ph.D. degree in Electronic and Electrical Engineering from the University of Edinburgh, U.K., in 2011. He then joined King's College London, U.K., as a Postdoctoral Research Associate. In 2011-2012, he was a visiting Postdoctoral Research Associate at Princeton University, USA. Since 2013, he has been working in the Department of Engineering at the University of Durham, U.K., as an Associate Professor (Reader) in Smart Grid (Assistant Professor in 2013-2017). Dr. Sun is a Senior Member of IEEE, Fellow of Higher Education Academy and Fellow of Durham Energy Institute. Dr. Sun's research interests include: communication system integration with smart grid, demand side management and renewable energy sources integration. He has published more than 90 papers in peer reviewed journals and international conferences, co-authored and edited published book chapters and has been involved as an investigator in international/national projects.

H. Vincent Poor

Vincent Poor is the Michael Henry Strater University Professor of Electrical Engineering at Princeton University, where he has been on the faculty since 1990. Professor Poor also holds ongoing appointments at several other institutions, including at Imperial College, Peking University and Tsinghua University. His research interests are in the areas of information theory and signal processing and their applications in energy systems, wireless networks and related elds. Professor Poor is a Member of the U.S. National Academy of Engineering and the U.S. National Academy of Sciences, an International Fellow of the Royal Academy of Engineering, a Corresponding Fellow of the Royal Society of Edinburgh and a Foreign Member of the Royal Society. Recent recognition of his work includes the 2016 John Fritz Medal, the 2017 IEEE Alexander Graham Bell Medal and honorary doctorates from a number of universities worldwide.